

REMARKS

This Preliminary Amendment cancels, without prejudice, claims 1 to 8 in the underlying PCT Application No. PCT/EP2003/013070 and adds new claims 9 to 18. The new claims, inter alia, conform the claims to United States Patent and Trademark Office rules and does not add any new matter to the application.

In accordance with 37 C.F.R. § 1.125(b), the Substitute Specification (including the Abstract) contains no new matter. The amendments reflected in the Substitute Specification (including Abstract) are to conform the Specification and Abstract to United States Patent and Trademark Office rules or to correct informalities. As required by 37 C.F.R. §§ 1.121(b)(3)(ii) and 1.125(c), a Marked-Up Version of the Substitute Specification comparing the Specification of record and the Substitute Specification also accompanies this Preliminary Amendment. Approval and entry of the Substitute Specification (including Abstract) are respectfully requested.

The underlying PCT Application No. PCT/EP2003/013070 includes an International Search Report, dated March 31, 2004, a copy of which is included. The Search Report includes a list of documents that were considered by the Examiner in the underlying PCT application.

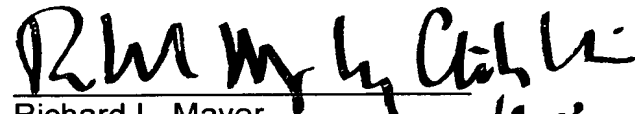
It is respectfully submitted that the subject matter of the present application is new, non-obvious and useful. Prompt consideration and allowance of the application are respectfully requested.

Respectfully submitted,

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CRASH BOX RADIATOR SUPPORT

FIELD OF THE INVENTION

The **present** invention relates to a crash box for a motor vehicle, ~~in particular e.g., for a passenger automobile, in accordance with the preamble of claim 1.~~

BACKGROUND INFORMATION

The use of a crash box in a conventional passenger automobile is generally known **conventional**. The purpose of the crash box is to absorb energy through controlled deformation in the event of an accident. To ensure that a damaged vehicle is inexpensive to repair, the separating point between a longitudinal beam and the crash box is generally in screw-connected form. This screw-connection point is often also used to secure other equipment holders, in which case the configuration must be such that the deformation of the crash box is influenced to the minimum possible extent.

~~DE~~ **German Published Patent Application No. 198 50 590 A1 has ~~disclosed~~ **describes** a front end region for a motor vehicle, in particular for a passenger automobile with a radiator or heat exchanger arrangement, which is connected to a front end structure at at least two bearing points. ~~In this document,~~ **The** at least two bearing points are designed ~~in~~ such a ~~manner~~ that in the event of impact-related deformation of the front end supporting structure, they link the heat exchanger arrangement into the deformation characteristic of the front end region in a force-transmitting and force-absorbing way. The heat exchanger arrangement, which may be composed of one or more heat exchangers, is braced into the front end supporting structure ~~in such a manner~~ that as a result of plastic deformation, it makes an additional contribution, in the manner of a soft barrier, to energy absorption and to the**

distribution of impact energy over large-area parts of the front end region. The region of use is ~~in this case~~ in a front module of a passenger automobile. Although the heat exchanger arrangement is linked into the deformation

5 characteristics in a force-transmitting and force-absorbing way in the event of an impact-related deformation of the front end supporting structure, no details are provided as to the influence of the connection between the heat exchanger arrangement and the front end supporting structure.

10 ~~DE~~ German Published Patent Application No. 100 51 567 A1 ~~has disclosed~~ describes a vehicle front end structure. A front end element of the vehicle, which includes at least one radiator, has an upper projection, which is secured to an
15 upper insertion hole in a front end wall of the vehicle, and a lower projection, which is secured to a lower insertion hole in the front end wall. If an external force which exceeds a predetermined level acts on the vehicle from the front side, the securing of the upper projection in the upper insertion
20 hole is released, whereas the securing of the lower projection in the lower insertion hole is maintained. This makes it possible to prevent the entire front end element from being detached from the front end wall when the external force acts on the vehicle from the front side.

25 Accordingly, it is possible to prevent damage to the front end element as a result of the external force, and at the same time the front end element is prevented from hitting a road surface.

30 SUMMARY

The An example embodiment of the present invention ~~deals with the problem of providing~~ may provide an improved embodiment for a crash box for a motor vehicle.

~~This problem is solved by the subject matter of the independent claim. Advantageous embodiments form the subject matter of the dependent claims.~~

5 The In an example embodiment of the present invention, ~~is based on the general concept of arranging~~ a mounting element (receiving part) for fitted parts, such as for example a radiator and/or heat exchanger arrangement, may be arranged on the crash box with the minimum possible influence on the
10 deformation characteristics of the crash box. ~~The invention involves attaching the~~ The radiator and/or heat exchanger arrangement may be attached directly to the crash box, with the geometric configuration being such that the mounting element, which is U-shaped in form, receives a receiving bolt
15 arranged on the radiator and/or heat exchanger arrangement.

The crash box has a plurality of fold beads arranged vertically and/or transversely with respect to a predetermined direction of deformation, with the mounting element, ~~according to the invention,~~
20 ~~being arranged in such a way that in each case one limb of the U-shaped mounting element runs~~ extends on either side of the fold beads, while the part which connects the two U-limbs of the U-shaped receiving part ~~runs~~ extends transversely with respect to the fold bead and has a similar
25 curvature in the opposite direction to the fold bead, so that the deformation properties are may not be impeded in any way manner. The similar, opposite curvature also has the effect of ventilating the mounting element from behind, so that spray water which penetrates ~~can~~ may run off or evaporate more
30 quickly, thereby improving the resistance to corrosion.

~~One particularly expedient~~ In an example embodiment of the solution ~~according to the~~ present invention, ~~is characterized in that the crash box has~~ may include crash box parts arranged
35 on both sides of the longitudinal center of the vehicle, and a

radiator and/or heat exchanger arrangement, positioned vertically, ~~is~~ may be arranged on the crash box, substantially transversely with respect to the longitudinal direction of the vehicle, the radiator and/or heat exchanger arrangement in
5 each case having a left-hand and a right-hand receiving bolt, which is received by a respective left-hand and right-hand, upwardly open U-shaped receiving part which is arranged on the respective crash box part, ~~and in that the~~. The radiator and/or heat exchanger arrangement, in a mounting state, ~~is~~ may
10 be mounted such that it ~~can~~ may rotate about an axis defined by the left-hand and right-hand receiving bolt and ~~can~~ may be slid ~~downwards~~ downwardly into or ~~upwards~~ upwardly out of the respective left-hand and right-hand U-shaped receiving part.

15 The result of this is that fitting of the radiator and/or heat exchanger arrangement ~~is~~ may be considerably facilitated and accelerated, thereby making it a less expensive operation. To fit the radiator and/or heat exchanger arrangement, the latter is pushed in ~~downwards~~ downwardly such that the two receiving
20 bolts move into the respective U-shaped, upwardly open mounting elements, and is prevented from rotational movement along an axis defined by the two receiving bolts by at least one connection at a transverse bridge. There ~~is~~ may be no need for further connection by screw connection, welding ~~or~~
25 ~~the like,~~ etc. The radiator and/or heat exchanger arrangement is therefore fixed in the operating state and ~~can~~ may easily be removed for repair and/or maintenance work by releasing the at least one connection at the transverse bridge.

30 ~~The invention offers the advantage of simple~~ Simple fitting and/or maintenance of the radiator and/or heat exchanger arrangement may be provided, which in times of ever increasing wage costs ~~helps~~ may help to reduce production and/or
35 maintenance costs.

It ~~is expediently~~ may be possible to provide that the left-hand and right-hand receiving bolts have a rubberized protective sheath. The result of this is that any vibration noises which may occur between receiving bolts and crash box
5 ~~de~~ may not form or ~~are~~ may not be transmitted, and consequently may have no adverse effect on driving comfort.

According to a ~~particularly expedient~~ an example embodiment, it ~~is~~ may be provided that the crash box is arranged at a
10 front or rear end of a motor vehicle. Depending on the type of vehicle, a drive device and an associated radiator and/or heat exchanger arrangement ~~is~~ may be located in a front or rear part of the motor vehicle. The ~~solution according to the invention is in this case~~ arrangement hereof may be configured
15 ~~in such a way that it can~~ may be used in both the front region and the rear region of the vehicle without difficulty.

Further ~~important features and advantages of the invention will emerge from the subclaims, from the drawings and from the associated description of figures~~ aspects hereof are described
20 below with reference to the drawings appended Figures.

It ~~will~~ should be understood that the features described above and those which are yet to be explained below ~~can~~ may be used
25 not only in the combination indicated in each instance, but also in other combinations or as stand-alone measures without departing from the spirit and scope ~~of the present invention hereof~~.

Preferred exemplary Exemplary embodiments of the invention
30 hereof are illustrated in the drawings Figures and explained in more detail in the following descriptions, in which identical reference numerals denote identical or similar or functionally equivalent equal components. ~~In the drawings:~~

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 ~~shows~~ is a perspective view of a crash box according to an example embodiment of the present invention with a radiator and/or heat exchanger arrangement[[,]].

5

Fig. 2 ~~shows~~ is a detail view of a receiving bolt and a mounting element[[,]].

Fig. 3 ~~shows~~ is a detail view as in Fig. 2, but from a
10 different perspective[[,]].

Fig. 4 ~~shows~~ is a ~~cross-section~~ cross-sectional view through a receiving bolt and a receiving part[[,]].

15 Fig. 5 ~~shows~~ is a detail view of a mounting element.

DETAILED DESCRIPTION

Fig. 1 illustrates a crash box arrangement which includes a left-hand crash box part 1 and a right-hand crash box part 2, a radiator and/or heat exchanger arrangement 3 and a receiving
20 bolt 5 and a mounting element 4. The crash box parts 1, 2 are arranged on both sides of a vehicle longitudinal center (~~not illustrated in Fig. 1~~) and hold a radiator and/or heat exchanger arrangement 3, which is suspended between the two
25 crash box parts 1, 2, is positioned vertically and is positioned substantially transversely with respect to a vehicle longitudinal direction, ~~not illustrated in Fig. 1~~.

The crash box parts 1, 2 form the crash box arrangement, ~~which is not designated further~~. The purpose of the crash box arrangement is to absorb energy through deformation along a deformation direction 12 in the event of an impact occurring substantially parallel to a vehicle longitudinal direction. As illustrated in Fig. 1, a plurality of fold beads 7, which
35 are arranged vertically and/or transversely with respect to

the predetermined deformation direction 12, are for this purpose incorporated in the crash box parts 1, 2. The fold beads 7 form an artificial weakening in the crash box parts 1 and 2 and effect compression and/or bending of the crash box parts 1, 2 at these weak points, and therefore an energy-absorbing action as a result of desired and predetermined deformation, in the event of a force which exceeds a predetermined level acting externally on a vehicle chassis ~~(not shown in Fig. 1)~~.

The radiator and/or heat exchanger arrangement 3 has in each case a left-hand receiving bolt 5 and a right-hand receiving bolt 5', which engage in respectively associated U-shaped mounting elements 4 and 4' provided for this purpose. The U-shaped, upwardly open mounting elements 4, 4' are arranged on the associated crash box part 1 and 2 by ~~way of~~ weld spots.

In mounting state, the radiator and/or heat exchanger arrangement 3 ~~can~~ may rotate about an axis of rotation 11, which is defined by the left-hand receiving bolt 5 and the right-hand receiving bolt 5'. At the same time, in the mounting state, the radiator and/or heat exchanger arrangement 3 ~~can~~ may be slid ~~downwards~~ downwardly into the mounting elements 4 and 4' or lifted out from the upwardly open U-shaped mounting elements 4, 4'. In an operating state, the radiator and/or heat exchanger arrangement 3 is fixed in place by a connecting element ~~(not shown in Fig. 1)~~ on a transverse bridge ~~(likewise not shown in Fig. 1)~~ and ~~is~~ may therefore be prevented from rotating about the axis of rotation 11.

As illustrated in Fig. 2, the radiator and/or heat exchanger arrangement 3 is suspended by the receiving bolts 5, 5' in the mounting elements 4, 4'. A rubberized protective sheath 6 is pulled over that end of the receiving bolts 5, 5' which is remote from the radiator and/or heat exchanger arrangement 3,

which receiving bolts have been pushed vertically ~~downwards~~
downwardly into the associated mounting element 4, 4'. The
rubberized protective sheath 6 ~~prevents~~ may prevent vibrations
from being transmitted from the crash box parts 1, 2 to the
5 radiator and/or heat exchanger arrangement 3 and visa versa,
and also ~~prevents~~ may prevent a noisy relative movement
between the receiving bolt 5, 5' and the mounting element 4,
4'.

10 It can be seen clearly from Fig. 4 that the mounting element 4
is in each case arranged with a left-hand and a right-hand
limb 9, 8 at an intermediate space 10 located between the fold
beads 7, with the fold bead 7 itself remaining cut away.
~~Ideally, the~~ The axis of rotation 11 ~~runs~~ may extend centrally
15 through the receiving bolt 5 and a base 14 of the fold bead 7.
The head-like formation of that end of the receiving bolt 5
which is remote from the radiator and/or heat exchanger
arrangement 3 ~~prevents~~ may prevent the radiator and/or heat
exchanger arrangement 3 from moving transversely with respect
20 to the longitudinal direction of the vehicle, i.e., along the
axis of rotation 11, and thereby ~~fixes~~ may fix it in place
between the two crash box parts 1, 2.

~~In accordance with~~ As illustrated in Fig. 2 and Fig. 3, the
25 mounting element 4 is arranged at a lower end of the fold bead
7. In principle, however, it is also ~~conceivable~~ possible for
the mounting element 4 to be arranged at a different position
along the fold bead 7. This is made possible by a curvature
13 ~~running~~ extending in the opposite direction to the fold
30 bead 7 and also parallel to the latter (cf. Fig. 5). The
curvature 13, similarly to the fold beads 7 in the crash box
parts 1, 2, forms a region which ~~can~~ may readily be deformed
along the deformation direction 12, i.e., transversely with
respect to the profile of a curvature valley.

Moreover, the curvature 13 ~~offers the considerable advantage of providing~~ may provide for ventilation for the mounting element 4 from the rear, so that penetrating spray water can may escape downward downwardly. Without the curvature 13, a blind formation would may result, leading to standing water being present therein, with an increased risk of corrosion.

To summarize, the following points should be noted:

10 A plurality of fold beads 7 are incorporated in the crash box parts 1, 2, producing an artificial weakening and effecting compression and/or bending in the event of a forceful impact along the deformation direction 12.

15 U-shaped, upwardly open mounting elements 4, 4' are arranged on the crash box parts 1, 2 by ~~way of~~ weld spots.

The mounting element 4, 4' is fitted to the fold bead 7 ~~in~~ such a way that in each case the left-hand and right-hand limbs 9, 8 are arranged at the intermediate space 10, and the fold bead 7 itself remains cut away.

The mounting element 4, 4' has a curvature 13 ~~running~~ extending in the opposite direction to the fold bead 7, (cf. Fig. 5) and, similarly to the fold beads 7, forms a region which is readily deformable.

Abstract

ABSTRACT

~~The present invention relates to a~~ **A** crash box for a motor vehicle, ~~in particular~~ **e.g.**, for a passenger automobile, having **includes** a plurality of fold beads ~~(7)~~ arranged vertically and/or transversely with respect to a predetermined direction of deformation of the crash box, and at least one mounting element ~~(4)~~ secured to the crash box. The mounting element ~~(4)~~ is arranged on one of the fold beads but is cut out over a fold bead ~~(7)~~ and/or provided with an oppositely curved, similar fold bead.

~~(Fig. 4)~~